Claims

[c1]   A method of operating a star tracker comprising:

in a ground station, determining multiple stay out zones for an object;

in a ground station, selecting a first stay out zone from the multiple stay out zones;

determining a star in the first stayout zone; and

determining a vehicle inertial attitude or angular velocity, based on star measurements of sensed or tracked stars, excluding the star within the first stayout zone.

[c2]   A method as recited in claim 1 wherein determining multiple stayout zones comprises calculating at least one circular stayout zone.

[c3]   A method as recited in claim 1 wherein determining multiple stayout zones comprises calculating at least one non-circular stayout zone.

[c4]   A method as recited in claim 1 wherein determining multiple stayout zones comprises calculating at least one non-circular stayout zone and one non-circular stayout zone.

[c5]   A method as recited in claim 1 wherein excluding the star is performed for a fixed period of time.

[c6]   A method as recited in claim 1 wherein excluding the star is performed for a non-fixed period of time.

[c7]   A method as recited in claim 1 wherein excluding the star is dependent on properties of the star and properties of the object.

[c8]   A method as recited in claim 7 wherein the property is brightness.

[c9]   A method as recited in claim 1 wherein further comprising controlling vehicle attitude or angular velocity, in response to the vehicle inertial attitude or angular velocity.

[c10]   A method as recited in claim 1 wherein excluding the star is performed on-board the vehicle.

[c11]   A method as recited in claim 1 wherein selecting comprises when a star is within the first exclusion zone, excluding the star,
when the star is in a second exclusion zone of the multiple exclusion zones, excluding the star when the brightness is below a first magnitude.

[c12]   A method as recited in claim 11 wherein the first exclusion zone has a different shape than the second exclu-

sion zone.

[c13] A method as recited in claim 11 further comprising when the star is in a third exclusion zone of the multiple exclusion zones, excluding the star when the brightness is below a second magnitude, different than the first magnitude.

[c14] A method as recited in claim 13 wherein the third exclusion zone has a different shape than the first exclusion zone or the second exclusion zone.

[c15] A method of determining a vehicle attitude or angular velocity, comprising:

in a ground station, calculating multiple stayout zones associated with a bright object, or a plurality of objects;

in a ground station, selecting a one stay out zone from the multiple stay out zones;

calculating the stars inside the stayout zone intruded by a bright object therein;

listing the stars inside the stayout zone in an exclusion list;

flagging star catalog or database entries, corresponding to stars listed on the exclusion list, as excluded from consideration by an attitude determination algorithm and procedure or a angular velocity determination algorithm and procedure; and

determining a vehicle inertial attitude or angular velocity, in response to data including star position measurements and the star catalog.

[c16] A method as recited in claim 15 wherein determining multiple stayout zones comprises calculating at least one circular stayout zone.

[c17] A method as recited in claim 15 wherein determining multiple stayout zones comprises calculating at least one non-circular stayout zone.

[c18] A method as recited in claim 15 wherein determining multiple stayout zones comprises calculating at least one non-circular stayout zone and one non-circular stayout zone.

[c19] A method as recited in claim 15 wherein excluding the star is performed for a fixed period of time.

[c20] A method as recited in claim 15 wherein excluding the star is performed for a non-fixed period of time.

[c21] A method as recited in claim 15 wherein excluding the star is dependent on properties of the star and properties of the object.

[c22] A method as recited in claim 21 wherein the property is brightness.

[c23]   A method as recited in claim 15 wherein further comprising controlling vehicle attitude or angular velocity, in response to the vehicle inertial attitude or angular velocity.

[c24]   A method as recited in claim 15 wherein excluding the star is performed on-board the vehicle.

[c25]   A method as recited in claim 15 wherein selecting comprises when a star is within the first exclusion zone, excluding the star,
when the star is in a second exclusion zone of the multiple exclusion zones, excluding the star when the brightness is below a first magnitude.

[c26]   A method as recited in claim 25 wherein the first exclusion zone has a different shape than the second exclusion zone.

[c27]   A method as recited in claim 25 further comprising when the star is in a third exclusion zone of the multiple exclusion zones, excluding the star when the brightness is below a second magnitude, different than the first magnitude.

[c28]   A method as recited in claim 27 wherein the third exclusion zone has a different shape than the first exclusion

zone or the second exclusion zone.

[c29] A system comprising:

a vehicle comprising,

an attitude control system or angular velocity control system;

a star tracker having field of view;

a ground station comprising,

a star catalog memory having a star catalog stored therein said star catalog having a plurality of entries, each entry having an associated flag therewith;

an exclusion list memory; and

a processor coupled to said attitude or angular velocity control system and said star catalog, said exclusion list memory, said processor determining multiple stay out zones for an object, selecting a stay out zone from the multiple stay out zones, determining a plurality of objects in the stayout zone, excluding at least one of the objects from the field of view within the stayout zone to form a revised database, star catalog, or star sub-catalog, determining a vehicle inertial attitude, angular velocity, relative star sensor or tracker alignment estimate, in response to the revised database, star catalog, or star sub-catalog and controlling the attitude control system or angular velocity system in response to the revised database, star catalog, or star sub-catalog.

[c30] A system as recited in claim 29 wherein the vehicle comprises a spacecraft.

[c31] A system as recited in claim 29 wherein said multiple stayout zones comprises calculating at least one circular stayout zone.

[c32] A system as recited in claim 29 wherein said multiple stayout zones comprises calculating at least one non-circular stayout zone.

[c33] A system as recited in claim 29 wherein said multiple stayout zones comprises calculating at least one circular rectangular stayout zone.

[c34] A system as recited in claim 29 wherein said multiple stayout zones comprises calculating at least one circular stayout zone and one non-circular stayout zone.

[c35] A system as recited in claim 29 wherein excluding the star is dependent on properties of the star and properties of the object.

[c36] A system as recited in claim 35 wherein the properties of the star and properties of the object comprise brightness.

[c37] A system as recited in claim 29 wherein selecting com-

prises when a star is within the first exclusion zone, said processor excluding the star,

when the star is in a second exclusion zone of the multiple exclusion zones, said processor excluding the star when the brightness is below a first magnitude.

[c38] A system as recited in claim 37 wherein the first exclusion zone has a different shape than the second exclusion zone.

[c39] A system as recited in claim 37 further comprising when the star is in a third exclusion zone of the multiple exclusion zones, said processor excluding the star when the brightness is below a second magnitude, different than the first magnitude.

[c40] A system as recited in claim 39 wherein the third exclusion zone has a different shape than the first exclusion zone or the second exclusion zone.